Rapid generation of report on post-seismic events with gmProcess: a case study for a dense accelerometric network in Veneto (NE Italy).

G. Capotosti[1], P.L. Bragato[1], L. Cataldi[1], P. Comelli[1], C. Scaini[1], H. Siracusa[1], P. Ziani[1]

[1]National Institute of Oceanography and Applied Geophysics – OGS, Italy

In 2022, the National Institute of Oceanography and Experimental Geophysics – OGS established a dense accelerometric network to monitor strong ground shaking occurrences in the Veneto region (Northeastern Italy) resulting from earthquakes. The network currently encompasses over 50% of the region's municipalities, comprising 312 installation sites. Its primary focus lies in collecting data for rapid damage assessment and facilitating the swift organization of rescue operations following seismic events. The infrastructure comprises state-of-the-art accelerometers utilizing the latest generation of cost-effective MEMS technology, characterized by high signal-to-noise ratio and sensitivity adequate for capturing recordings useful for earthquakes with a magnitude exceeding 2.0.

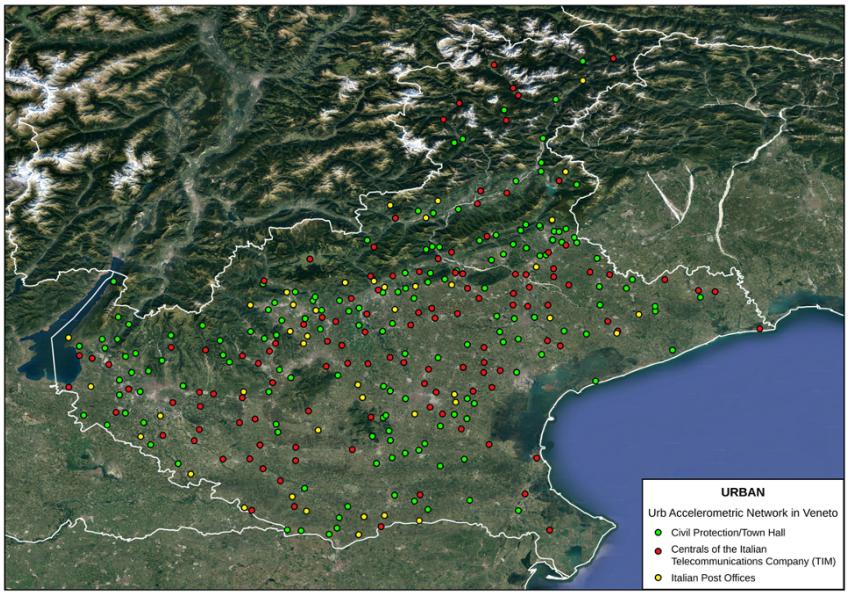

Fig. 1 – The accelerometric network (UrbAN – Urb Accelerometric Network in Veneto)

This dense accelerometric network employs the open-source software tool "gmProcess," developed by the United States Geological Survey (USGS), to process ground motion. This software processes ground motion data recorded during earthquakes, with a focus on strong motion data. It is designed to automate and simplify data analysis and is ideal for real-time or near real-time applications, such as immediate earthquake response. The software standardizes data from different seismic networks, calculates essential parameters for seismic engineering (acceleration, velocity, displacement,

response spectra), and includes tools for creating shake maps and products for seismic hazard analysis. The program is based on modern technologies such as the Python library ObsPy, is highly customizable to local or regional requirements and is suitable for managing large volumes of seismic data. In addition, it generates comprehensive reports that summarize key parameters (PGA, PGV, PGD), analyze data quality, highlight potential anomalies and include clear visualizations to facilitate both technical analysis and broad-level communication. These reports support decisions by engineers and emergency responders by systematically documenting ground behavior during earthquakes. Given the extensive volume of waveforms and the necessity for near real-time processing, we leverage the High-Performance Computing (HPC) infrastructure provided by the research infrastructure TeRABIT (Terabit Network for Research and Academic Big Data in ITaly). The advantages of integrating HPC infrastructure into a seismic monitoring network are discussed in the context of this case study in north-eastern Italy.

Acknowledgments

Rapid generation of reports on post-seismic events with gmProcess: a case study for a dense accelerometric network in Veneto (NE Italy) was supported by the National Recovery and Resilience Plan project TeRABIT (Terabit network for Research and Academic Big data in Italy - IR0000022 - PNRR Missione 4, Componente 2, Investimento 3.1 CUP I53C21000370006) in the frame of the European Union - NextGenerationEU funding.

References

Bragato P.L., Boaga, J., Capotosti, G**.**, Comelli P., Parolai, S., Rossi, G., Siracusa, H., Ziani, P. and Zuliani D.; (2023). Implementing a dense accelerometer network in Veneto (NE Italy): a support for rapid earthquake impact assessment. (Paper Review: Bulletin of Earthquake Engineering)

Bragato, P.L., Boaga, J., Capotosti, G**.**, Comelli P., Parolai, S., Rossi, G., Siracusa, H., Ziani, P. and Zuliani D., (2023). Relazione Tecnica e Scientifica sull'attuazione dell'Azione 5.3.1 del POR FESR Regione del Veneto 2014-2020. Relazione Interna OGS 2023/30 https://hdl.handle.net/20.500.14083/17342

Corresponding author: Giorgio Capotosti gcapotosti@ogs.it